

Appl. No. 10/740,076
Amdt. dated February 3, 2006
Reply to Office Action of August 4, 2005

REMARKS / ARGUMENTS

Summary of the Present Invention

The present invention is a catalyst for the conversion of carbon monoxide. More specifically, this invention relates to catalyst comprising a support having a predetermined pore size and a metal capable of forming a metal carbonyl species. The catalyst efficiently facilitates the selective hydrogenation of carbon monoxide using H₂ that is present in a reformate and reduces the concentration of the CO to levels equal to or less than about 50 ppm.

Remarks Regarding Elections/Restrictions

Claims 1 – 25 remain in the application. Claim 26 has been withdrawn in response to a requirement by the examiner under 35 U.S.C. 121 that the claims be restricted to one of the two mutually exclusive species represented. No change in inventorship is necessitated by the withdrawal of Claim 26. Invention I of the two inventions distinguished by the examiner is elected with traverse. In view of the examiner's earlier restriction requirement, applicant retains the right to present claim 26, designated by the examiner as invention II, in a divisional application.

Remarks Regarding Double Patenting

The Examiner has provisionally rejected claims 1 – 25 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 – 20 of copending Application Number 10/740,144. Concurrent with the filing of this Amendment, Applicant is filing a terminal disclaimer with the Commissioner of Patents, a copy of which is attached.

Remarks Regarding Claims Rejected Under 35 USC §102(b) and 35 USC §103(a)

Claims 1 – 25 remain in the application. Claims 2 – 13 depend from independent Claim 1, Claims 15 – 19 depend from independent Claim 14, and Claims 21 – 25 depend from independent Claim 20.

U.S. Patent 4,740,487

The Examiner has rejected Claims 1 – 20 under 35 U.S.C. §102(b) as anticipated by Matheson (U.S. Patent 4,740,487, "the '487 patent"). The '487 patent teaches and claims catalyst composition comprising ruthenium or a ruthenium containing material together with a zeolite support material and a refractory support impregnated with a Group VI or Group VIII metal or a

Appl. No. 10/740,076
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combination of such metals. The catalyst composition taught in the '487 patent is intended for use in hydrotreating and hydrocracking applications. There is no teaching or suggestion in the '487 patent that a catalyst composition comprising ruthenium or a ruthenium containing material together with a zeolite support material and a refractory support impregnated with a Group VI or Group VIII metal or a combination of such metals can be used in a selective methanation reaction. In fact, there is no teaching or suggestion that carbon monoxide should even be present within the feedstream when using the catalyst of the '487 patent. Rather, the catalyst is tested using quinoline and CS₂ in an n-heptane carrier and with the autoclave flushed with nitrogen. In the absence of carbon monoxide, the metal of the catalyst cannot form metal carbonyl species and the pores of the catalyst support cannot accommodate a fully carbonylated metal complex in the absence of a fully carbonylated metal complex. By reading the '487 patent, one of ordinary skill in the art would not be motivated to use the catalyst of the '487 patent, or a similar catalyst, for selective methanation. Thus, independent Claim 1 and its dependent Claims 2 – 6, independent Claim 7, independent Claim 8 and its dependent Claims 9 – 10, independent Claim 11 and its dependent Claims 12 – 15, and independent Claim 16 and its dependent Claims 17 – 20 are not anticipated in view of U.S. Patent 4,740,487.

U.S. Patent 6,017,840

The Examiner has rejected Claims 1 – 25 under 35 U.S.C §102(b) as anticipated by Wu et al. (U.S. Patent 6,017,840, "the '840 patent"). The '840 patent teaches and claims a metal-promoted beta-zeolite catalyst for use in hydrotreating hydrocarbon chains. There is no teaching or suggestion in the '840 patent that metal-promoted beta-zeolite composition of the '840 patent can be used in a selective methanation reaction. There is no teaching or suggestion that carbon monoxide should be present within the feedstream when using the catalyst of the '840 patent. Rather, the catalyst is intended for use with hydrocarbon feedstreams, preferably with C₉₊ aromatic compounds. The feedstream may further include paraffins, olefins, and naphthenes – none of which are similar in structure or composition to carbon monoxide. At column 8, line 67 – column 9, line 13, representative hydrocarbons suitable for feedstreams for a process using the metal-promoted beta-zeolite composition are listed – none of which even contain oxygen in the chemical compositions. In the absence of carbon monoxide, the metal of the catalyst cannot form metal carbonyl species and the pores of the catalyst support cannot accommodate a fully carbonylated metal complex in the absence of a fully carbonylated metal complex. By reading the '840 patent, one of ordinary skill in the art would not be motivated to use the catalyst of the '840 patent, or a similar catalyst, for selective methanation. Thus, independent Claim 1 and its

Appl. No. 10/740,076
Amdt. dated February 3, 2006
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dependent Claims 2 – 6, independent Claim 7, independent Claim 8 and its dependent Claims 9 – 10, independent Claim 11 and its dependent Claims 12 – 15, and independent Claim 16 and its dependent Claims 17 – 20 are not anticipated in view of U.S. Patent 6,017,840.

U.S. Patent 5,166,370

The Examiner has rejected Claims 1 – 25 under 35 U.S.C §102(b) as anticipated by Liotta, Jr. et al. (U.S. Patent 5,166,370, “the ‘370 patent”). The ‘370 patent teaches and claims a process for the production of tetrahydrofuran using a transition metal and zeolite catalyst. The catalyst composition taught in the ‘370 patent is intended for use in converting 4-hydroxybutanal to tetrahydrofuran. There is no teaching or suggestion in the ‘370 patent that the transition metal / zeolite catalyst of the ‘370 patent can be used to effect hydrogenation of carbon monoxide. Representative examples 1 – 21 of the ‘370 patent all use the same feedstream: an aqueous solution of 4-hydroxybutanal and 3-hydroxy-2-methylpropanal. Neither of these starting compounds is similar in structure or composition to carbon monoxide. Moreover, in the conversion of 4-hydroxybutanal to tetrahydrofuran it is unlikely that the C-O group is separated from the 4- hydroxybutanal by the metal. Rather, this conversion is most likely the result of a ring-opening reaction wherein the metal promotes the ring-opening. Regardless of the mechanism of conversion, there is no teaching or suggestion in the ‘370 patent that a metal carbonyl species is formed, and the pores of the catalyst support cannot accommodate a fully carbonylated metal complex in the absence of a fully carbonylated metal complex. By reading the ‘370 patent, one of ordinary skill in the art would not be motivated to use the catalyst of the ‘370 patent, or a similar catalyst, for the conversion of carbon monoxide to methane. Thus, independent Claim 1 and its dependent Claims 2 – 6, independent Claim 7, independent Claim 8 and its dependent Claims 9 – 10, independent Claim 11 and its dependent Claims 12 – 15, and independent Claim 16 and its dependent Claims 17 – 20 are not anticipated in view of U.S. Patent 5,166,370.

EP 0 338 734

The Examiner has rejected Claims 1 – 7, 10 – 16, 19 – 20 and 22 – 24 under 35 U.S.C §102(b) as anticipated by Makkee (EP 0 338 734, “the ‘734 patent”). The ‘734 patent teaches and claims a hydroalkylation process using a transition metal and beta-zeolite catalyst. The catalyst composition taught in the ‘734 patent is intended for use in a reductive alkylation process. More specifically, the process is used for converting aromatic hydrocarbons to more saturated alkyl ring compounds. There is no teaching or suggestion in the ‘734 patent that the

Appl. No. 10/740,076
Amdt. dated February 3, 2006
Reply to Office Action of August 4, 2005

transition metal / zeolite catalyst of the '734 patent can be used to effect hydrogenation of carbon monoxide. There is no teaching or suggestion in the '734 patent that carbon monoxide is, or can be, present in the feedstream. In fact, those skilled in the art would be tempted to avoid the presence of carbon monoxide in the feedstream when practicing the technology of the '734 patent because of the risk of forming undesirable oxygenated by-products. Thus, by reading the '734 patent, one of ordinary skill in the art would not be motivated to use the catalyst of the '734 patent, or a similar catalyst, for the conversion of carbon monoxide to methane. Thus, independent Claim 1 and its dependent Claims 2 – 6, independent Claim 7, independent Claim 8 and its dependent Claims 9 – 10, independent Claim 11 and its dependent Claims 12 – 15, and independent Claim 16 and its dependent Claims 17 – 20 are not anticipated in view of EP 0 338 734.

EP 0 338 734 and U.S. Patent 6,037,513

The Examiner has rejected Claims 8 – 9, 17 – 18 and 25 under 35 U.S.C §103(a) as obvious under Makkee (EP 0 338 734, "the '734 patent") and has rejected Claims 1 – 7, 10 – 16, 19 – 20 and 22 – 24 as obvious under Makkee (EP 0 338 734, "the '513 patent") in view of Chang et al. (U.S. Patent 6,037,513, "the '513 patent"). As noted above, the '734 patent teaches and claims a hydroalkylation process using a transition metal and beta-zeolite catalyst. The '513 patent similarly teaches and claims a process for hydroalkylation of aromatic hydrocarbons using a transition metal on a crystalline inorganic oxide support material. The catalyst composition taught in the '734 patent is intended for use in a reductive alkylation process. More specifically, the process is used for converting aromatic hydrocarbons to more saturated alkyl ring compounds. Similarly, the catalyst composition taught in the '513 patent is intended for use in a reductive alkylation process. More specifically, the process is used for converting aromatic hydrocarbons, such as benzene, to more saturated alkyl ring compounds, such as cyclohexane. There is no teaching or suggestion in either the '734 patent or in the '513 patent that the transition metal / zeolite catalyst of either the '734 patent or the '513 patent can be used to effect hydrogenation of carbon monoxide. In fact, those skilled in the art would be tempted to avoid the presence of carbon monoxide in the feedstream when practicing the technology of the '734 patent or of the '512 patent because of the risk of forming undesirable oxygenated by-products. By reading either the '734 patent or the '513 patent, individually or in combination, one of ordinary skill in the art would not be motivated to use the catalyst of either the '734 patent or the '513 patent, or any similar catalysts, for the conversion of carbon monoxide to methane. Thus, independent Claim 1 and its dependent Claims 2 – 6, independent Claim 7, independent Claim 8 and its dependent

Appl. No. 10/740,076
Amdt. dated February 3, 2006
Reply to Office Action of August 4, 2005

Claims 9 – 10, independent Claim 11 and its dependent Claims 12 – 15, and independent Claim 16 and its dependent Claims 17 – 20 are not anticipated in view of EP 0 338 734 or U.S. Patent 6,037,513, with either taken alone or taken in combination.

Remarks Regarding Allowable Subject Matter

The Examiner has not indicated that there is any allowable subject matter at this time.

Remarks Regarding Citations

Applicant has made note of the prior art recited by the Examiner in the Notice of References Cited.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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Appl. No. 10/740,076
Amtd. dated February 3, 2006
Reply to Office Action of August 4, 2005

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Remarks Regarding Allowable Subject Matter

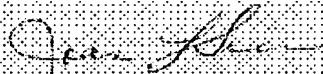
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Applicant has made note of the prior art recited by the Examiner in the Notice of References Cited.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

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